Article 19

WHAT IS CLAIMED IS:

S4B B1

1. An organic-inorganic composite graded material which is an organic-inorganic composite material containing a composite in which an organic polymer compound and a metallic compound are bonded to each other, and having a component-graded structure in which the content of the metallic compound in the material continuously changes in the depth direction from the surface of the material.

2. The organic-inorganic composite graded material of claim 1, wherein the organic-inorganic composite material is a composite in which the organic polymer compound and the metallic compound are bonded to each other.

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3. The organic-inorganic composite graded material of claim 1 or 2, wherein the metallic compound is a metal-oxide-containing compound.

4. The organic-inorganic composite graded material of claim 1 or 2, wherein the metallic compound is a metal-nitride-containing compound in which the metallic compound is bonded to the organic polymer compound through a metal-oxide-containing compound.

5. The organic-inorganic composite graded material of any one of claims 1 to 4, which has a thickness of 5 μm or less.

6. The organic-inorganic composite graded material of claim 3 or 5, wherein the composite in which the organic polymer compound and the metallic compound are bonded to each other is a hydrolysis product from a mixture of the organic polymer compound having a molecule containing a metal-containing group capable of bonding to a metal oxide by hydrolysis with a metal compound capable of forming a metal oxide by hydrolysis.

7. The organic-inorganic composite graded material of claim 4 or 5, wherein the composite in which the organic polymer compound and the metallic compound are bonded to each other is a hydrolysis product from a mixture of the organic polymer compound having a molecule containing a metal-containing group capable of bonding to a metal nitride polymer by hydrolysis with a metal nitride polymer.

8. The organic-inorganic composite graded material of claim 6 or 7, wherein the organic polymer compound having a molecule containing a metal-containing group capable of bonding to a metal oxide or a metal nitride polymer by hydrolysis is a copolymer or polycondensate from a monomer having the metal-containing group and a monomer containing no metal.

9. The organic-inorganic composite graded material of claim 8, wherein the organic polymer compound having a molecule containing a metal-containing group capable of bonding to a metal oxide or a metal nitride polymer by hydrolysis is a copolymer from a monomer having an ethylenically unsaturated group and a monomer containing an ethylenically unsaturated group and the metal-containing group.

10. The organic-inorganic composite graded material of claim 6, wherein the metal compound capable of forming a metal oxide by hydrolysis is a metal alkoxide.

11. The organic-inorganic composite graded material of any one of claims 1 to 10, which is a film-shaped product formed on an organic substrate, the film-shaped product substantially having a surface formed of a component from the organic polymer compound, the surface

being in contact with the organic substrate, and an open surface formed of a component from the metallic compound.

12. A process for the production of the organic-inorganic composite graded material recited in any one of claims 1 to 4, which comprises preparing a coating solution which is a mixture of (A) an organic polymer compound having a molecule containing a metal-containing group capable of bonding to a metal oxide or metal nitride polymer by hydrolysis with (B)(a) a metal compound capable of forming a metal oxide by hydrolysis or (b) a metal nitride polymer, or preparing a hydrolysis product of the mixture, forming a coating film made of the above coating solution on a substrate made of an organic material and drying the coating film under heat.

13. The process of claim 12, ~~wherein the coating film~~ is dried to have a thickness of 5 μm or less.

14. The process of claim 12 or 13, wherein the organic polymer compound, as Component (A), having a molecule containing a metal-containing group capable of bonding to a metal oxide or a metal nitride polymer by hydrolysis is a copolymer or polycondensate from a monomer having the metal-containing group and a monomer containing no metal.

15. The process of any one of claims 12 to 14, wherein the organic polymer compound, as Component (A), having a molecule containing a metal-containing group capable of bonding to a metal oxide or a metal nitride polymer by hydrolysis is a copolymer from a monomer having an ethylenically unsaturated group and a monomer containing an ethylenically unsaturated group and the metal-containing group.

16. The process of any one of claims 12 to 15, wherein the metal compound, as Component (B)(a), capable of forming a metal oxide by hydrolysis is a metal alkoxide.

17. A coating agent made of the organic-inorganic composite graded material of any one of claims 1 to 11 for forming a coating film on a substrate.

18. The coating agent of claim 17, which is made of a coating solution which is a mixture of (A) an organic polymer compound having a molecule containing a metal-containing group capable of bonding to a metal oxide or metal nitride polymer by hydrolysis with (B)(a) a metal compound capable of forming a metal oxide by hydrolysis or (b) a metal nitride polymer, or a hydrolysis product of the mixture.

19. The coating agent of claim 17 or 18, which is for use for forming a coating film on an organic substrate.

20. The coating agent of claim 17 or 18, which is for use as an adhesive between an organic material and an inorganic or metallic material.

21. The coating agent of claim 17 or 18, which is for use for forming an intermediate film to be interposed between an organic substrate and a coating layer containing at least an inorganic or metallic material.

22. The coating agent of claim 21, wherein the coating layer containing at least an inorganic or metallic material is a photocatalytic material layer.

23. The coating agent of claim 21, wherein the coating layer containing at least an inorganic or metallic material is an inorganic or metallic electrically

conductive material layer.

24. The coating agent of claim 21, wherein the coating layer containing at least an inorganic or metallic material is a hard coating layer containing an inorganic or metallic material.

25. The coating agent of claim 21, wherein the coating layer containing at least an inorganic or metallic material is an inorganic or metallic optical recording material layer or an inorganic or metallic dielectric material layer.

26. The coating agent of claim 17 or 18, which is for use for forming an intermediate film to be interposed between a metallic substrate having an organic coating film on a surface and a photocatalytic material layer.

27. The coating agent of claim 22 or 26, wherein the photocatalytic material layer is a titanium dioxide coating film.

28. A substrate using the organic-inorganic composite graded material recited in any one of claims 1 to 11.

29. The substrate of claim 28, which is an organic substrate.

30. The substrate of claim 29, wherein the organic substrate has the organic-inorganic composite graded material interposed as an intermediate film and has a coating layer containing at least an inorganic or metallic material.

31. The substrate of claim 28, which is a metallic substrate having the organic-inorganic composite graded

material interposed as an intermediate film and having a photocatalytic material layer, and has a surface on which an organic coating film is to be formed.

32. An organic-inorganic adhesive material using the organic-inorganic composite graded material of any one of claims 1 to 11 as an adhesive.

33. An article having the organic-inorganic composite graded material of any one of claims 1 to 11 interposed as an intermediate film and having a coating layer containing at least an inorganic or metallic material.

34. The article of claim 33, wherein the coating layer containing at least an inorganic or metallic material is a photocatalytic material layer.

35. The article of claim 33, wherein the coating layer containing at least an inorganic or metallic material is an inorganic or metallic electrically conductive material layer.

36. The article of claim 33, wherein the coating layer containing at least an inorganic or metallic material is a hard coating layer containing an inorganic or metallic material.

37. The article of claim 33, wherein the coating layer containing at least an inorganic or metallic material is an inorganic or metallic optical recording material layer or an inorganic or metallic dielectric material layer.